

JET BOX FOR ELECTROPLATING EQUIPMENT

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates to electroplating technology
5 and more particularly, to a jet box for use in an electroplating
equipment, which can eject jets of an electroplating solution evenly
onto the plating workpiece, preventing an electrical short circuit.

2. Description of the Related Art:

In an electroplating equipment, plate electrodes are provided
10 for causing an electroplating reaction. When a plating workpiece is
moved through the gap between two jet boxes, the jet boxes eject jets
of the applied electroplating solution onto the surface of the plating
workpiece, causing formation of a coating layer on the surface of the
plating workpiece. However, conventional electroplating equipments
15 commonly have the drawbacks as follows:

1. The applied electroplating solution is ejected out of jet holes of
jet boxes onto the surface of the plating workpiece at different
pressures, and the plating workpiece may be forced to vibrate
and to touch the plate electrodes due to unequal jet pressures,
20 causing an accidental short circuit and interrupting the
electroplating operation.
2. The plate electrodes will hinder the ejected electroplating
solution, and the electroplating solution will not be evenly
ejected onto the surface of the plating workpiece, resulting in
25 thickness deviation of the plating layer or burnt plating.
3. The plate electrodes are fixedly mounted in the jet boxes, not
convenient for replacement.

SUMMARY OF THE INVENTION

The present invention has been accomplished under the circumstances in view. It is one object of the present invention to provide a jet box for electroplating equipment, which utilizes
5 current-diffusion members to equalize the pressure of the applied electroplating solution, enabling the applied electroplating solution to be evenly ejected onto the surface of the plating workpiece and preventing vibration of the plating workpiece during electroplating.

It is another object of the present invention to provide a jet
10 box for electroplating equipment, which comprises a box body, a plurality of current-diffusion members mounted in respective jet chambers to equalize the pressure of the applied electroplating solution, and a plate electrode set covering over the jet chambers and the current-diffusion members, wherein the plate electrode set is
15 detachably coupled to the box body, facilitating maintenance and replacement.

It is still another object of the present invention to provide a jet box for electroplating equipment, which comprises a box body, a plurality of current-diffusion members mounted in respective jet
20 chambers to equalize the pressure of the applied electroplating solution, and a plate electrode set covering over the jet chambers and the current-diffusion members, wherein the plate electrode set comprises an anode plate covering the front open sides of the jet chambers of the box body over the current-diffusion members, and a
25 shield, which is mounted at the front side of the anode plate opposite to the box body to prohibit the plating workpiece from contacting the anode plate to cause an accidental electrical short circuit, and, which

comprises a plurality transverse rods and transverse slots alternatively disposed at different elevations in a parallel manner and sloping at a predetermined angle.

It is still another object of the present invention to provide a
5 jet box for electroplating equipment, which comprises a box body, a plurality of current-diffusion members mounted in respective jet chambers to equalize the pressure of the applied electroplating solution, and a plate electrode set comprised of an anode plate and a shield and covered over the jet chambers and the current-diffusion
10 members, wherein the anode plate of the plate electrode set has a plurality of jet holes cut through opposing front and back sides thereof and kept in communication with the jet chambers for ejecting the applied electroplating solution onto the plating workpiece.

DESCRIPTION OF THE DRAWINGS

15 FIG. 1 is an elevational view of a jet box for electroplating equipment in accordance with the present invention.

FIG. 2 is a perspective view of one current-diffusion member used in the jet box for electroplating equipment in accordance with the present invention.

20 FIG. 3 is an exploded view of the jet box for electroplating equipment in accordance with the present invention (I).

FIG. 4 is a sectional elevation and partially exploded view of a part of the jet box for electroplating equipment in accordance with the present invention.

25 FIG. 5 is a sectional view of the jet box for electroplating equipment in accordance with the present invention.

FIG. 6 is an applied view of the present invention, illustrating

two jet boxes symmetrically arranged in an electroplating equipment and controlled to eject jets of an electroplating solution onto a plating workpiece.

FIG. 7 is a schematic applied view of the present invention,
5 illustrating one throttling cock adjusted.

FIG. 8 is a schematic applied view of the present invention, illustrating the flowing direction of the applied electroplating solution.

FIG. 9 is a schematic drawing of the present invention,
10 illustrating the plate electrode set moved relative to the box body for replacement.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1-5, a jet box **10** in accordance with the present invention is shown. The jet box **10** comprises a box body **1**, a
15 plurality of current-diffusion members **2**, and a plate electrode set **3**.

The box body **1** is a hollow container comprising a plurality of jet chambers **11** disposed at the front side thereof at different elevations, a fluid passage **12** defined at a back side relative to the jet chambers **11**, a plurality of throttle holes **14** respectively disposed
20 in communication between the jet chambers **11** and the fluid passage **12**, two coupling grooves **13** respectively vertically formed in two opposite lateral sidewalls thereof, a plurality of mounting screw holes **15** located in the back side thereof in communication with the fluid passage **12** and respectively aimed at the throttle holes **14**, a
25 throttling cock **16** threaded into each mounting screw hole **15** and inserted into one respective throttle hole **14**, a plurality of overflow holes **17** respectively located in the back side of the jet chambers **11**

in communication between the jet chambers **11** and the fluid passage **12**, a plurality of pressure equalizing pipes **18** respectively connected to the overflow holes **17** and extended through the fluid passage **12** and the back side of the box body **1** to the outside of the box body **1**,
5 and a connection pipe **19** located at the bottom side thereof in communication with the fluid passage **12**.

The current-diffusion members **2** are respectively mounted in the respective front open sides of the jet chambers **11**, each comprising a first partition board **21**, which has its bottom edge
10 abutted against the bottom wall of the associating jet chamber **11**, a second partition board **22**, which has its top edge abutted against the top wall of the associating jet chamber **11**, and a plurality of connection rods **23** connected between the first partition board **21** and the second partition board **22**.

15 The plate electrode set **3** comprises an anode plate **31** covering the front open sides of the jet chambers **11** of the box body **1**, a shield **32** mounted at the front side of the anode plate **31**, and a plurality of positioning devices **33** bilaterally and symmetrically mounted at the back side of the anode plate **31** at different elevations.
20 Each positioning device **33** comprises a stem **331** fixedly connected to the anode plate **31**, and a positioning plate **332** formed integral with one end of the stem **331** remote from the anode plate **31** and coupled to one respective coupling groove **13** of the box body **1**. Further, the anode plate **31** comprises a plurality of jet holes **311** cut
25 through opposing front and back sides thereof and kept in communication with the jet chambers **11**. The shield **32** defines a plurality transverse rods **321** and transverse slots **322** alternatively

disposed at different elevations in a parallel manner and sloping at a predetermined angle. Thus, the jet holes **311** are exposed to the outside through the transverse slots **322**.

Referring to FIGS. 6-8, during application of the present invention, two jet boxes **10** are symmetrically arranged in an electroplating equipment at two opposite sides and kept facing each other with the respective connection pipes **19** connected to an electroplating solution source **40**. During electroplating, the plating workpiece **50** is held in between the two jet boxes **10** by a workpiece clamp **60** and moved with the workpiece clamp **60** to pass through the gap between the two jet boxes **10**. As shown in FIGS. 7 and 8, the jet box **10** is mounted in a vertical position. When the electroplating solution is provided upwardly from the electroplating solution source **40** into the fluid passage **12** and then the jet chambers **11**, the fluid pressures in the jet chambers **11** will be different. At this time, the throttling cocks **16** can be respectively operated to regulate the flow rate of the respective throttle holes **14**, thereby equalizing the fluid pressures in the jet chambers **11**. Further, when the electroplating solution is flowing out of the respective jet chambers **11** into the respective current-diffusion members **2**, it will flow over the top edges of the respective first partition boards **21** and then over the bottom edges of the respective second partition boards **22**, and therefore, the pressure of the electroplating solution is equalized when the electroplating solution comes out of the current-diffusion members **2**. Further, when the pressure of the electroplating solution in one jet chamber **11** reaches or surpasses a predetermined threshold, the electroplating solution will flow out of the respective jet

chamber **11** through the respective overflow hole **17** and the respective pressure equalizing pipes **18** to an external hold-up tank (not shown) outside the box body **1**, keeping the fluid pressures in the jet chambers **11**. Further, the storage electroplating fluid held in the external hold-up tank can be resupplied with the consumption of the metal ion, maintaining the concentration of the electroplating solution. Because the fluid pressure of the electroplating solution is equalized by the current-diffusion member **2** before ejection, the fluid pressures of the jets of the electroplating solution that are forced out of the jet holes **311** of the anode plate **31** of the plate electrode set **3** are maintained equal, and therefore the electroplating solution can be ejected onto the two opposite sides of the plating workpiece **50** at the same pressure by the two jet boxes **10**, enabling the plating workpiece **50** to be evenly plated. Further, the shield **32** of the jet boxes **10** prohibit direct contact between the plating workpiece **50** and the anode plates **31** to cause an accidental short circuit.

Referring to FIGS. 3 and 6 again, as stated above, the transverse rods **321** of the shield **32** slope in one direction, therefore, the shield **32** will not shade a specific part of the plating workpiece **50** during electroplating, enabling the electroplating solution to be evenly ejected onto the surface of the plating workpiece **50** and preventing thickness deviation of the plating layer or burnt plating.

What the invention claimed is:

1. A jet box used in an electroplating equipment, comprising:

5 a box body comprising a plurality of jet chambers disposed at a front side thereof at different elevations, each said jet chamber defining a front open side, a fluid passage defined at a back side relative to said jet chambers and connected to an external electroplating solution source, and two coupling grooves respectively vertically formed in two opposite lateral sidewalls
10 thereof;

a plurality of current-diffusion members respectively mounted in respective front open sides of said jet chambers, each said current-diffusion member comprising a first partition board and a second partition board arranged in a vertical position in a parallel
15 manner, said first partition board having a bottom edge thereof abutted against a bottom wall of the associating said jet chamber, said second partition board having a top edge thereof abutted against a top wall of the associating said jet chamber; and

a plate electrode set comprising an anode plate covering the
20 front open sides of said jet chambers of said box body, a shield mounted at a front side of said anode plate opposite to said box body and a plurality of positioning devices bilaterally and symmetrically mounted at a back side of said anode plate at different elevations and respectively coupled to said guide grooves of said box body, said
25 anode plate comprising a plurality of jet holes cut through opposing front and back sides thereof and kept in communication with said jet chambers of said box body, said shield comprising a plurality

transverse rods and transverse slots alternatively disposed at different elevations in a parallel manner and sloping at a predetermined angle.

2. The jet box as claimed in claim 1, wherein said box body
5 further comprises a plurality of throttle holes respectively disposed in communication between said jet chambers and said fluid passage, a plurality of mounting screw holes located in a back side thereof in communication with said fluid passage and respectively aimed at
10 said throttle holes, a throttling cock threaded into each said mounting screw hole and inserted into one respective said throttle hole and rotatable to adjust the flow rate of the respective said throttle hole, a plurality of overflow holes respectively disposed in communication between said jet chambers and said fluid passage, and a plurality of pressure equalizing pipes respectively connected to
15 said overflow holes and extended through said fluid passage and the back side of said box body to the outside of said box body.

3. The jet box as claimed in claim 1, wherein each said current-diffusion member further comprises a plurality of connection rods connected between said first partition board and said second
20 partition board.

4. The jet box as claimed in claim 1, wherein each said positioning device of said plate electrode set comprises a stem fixedly connected to said anode plate, and a positioning plate formed integral with one end of said stem remote from said anode plate and
25 coupled to one respective said coupling groove of said box body.